

REMARKS / ARGUMENTS

Reconsideration of the application is requested.

Claims 1-5, 13-17, and 19-24 remain in the application.

In item 4 on pages 2-5 of the above-mentioned Office action, claims 1-5, 13-17 and 19-24 have been rejected as being unpatentable over Akagawa et al. (European Patent Application Publication No. 0 734 059 A2) in view of Akram et al. (US Pat. No. 6,107,109) and IBM Technical Bulletin, "Solder Plated Resin Ball," Vol. 38, pages 463-464 (May 1995) under 35 U.S.C. § 103(a).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

said thickness of said second insulating layer, said elasticity of said conductive material, and said elasticity of said small balls being selected for obtaining a desired level of comparatively good

mechanical decoupling from a printed circuit board upon the semiconductor component being soldered onto the printed circuit board.

Claim 3 calls for, inter alia:

selecting the thickness of said second insulating layer, the elasticity of the conductive material, and the elasticity of the small balls to obtain a desired level of comparatively good mechanical decoupling from a printed circuit board upon the semiconductor component being soldered onto the printed circuit board.

The Examiner has stated in the second paragraph on page 3 of the Office action that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the resin ball of the IBM Technical Bulletin in the method and product of Akagawa et al. in order to increase resistance to thermal stress. However, this is not claimed in claim 1 and, in fact, is not the object of the invention of the instant application.

Claim 1 of the instant application recites that the combination of the elasticity of the small balls, the elasticity of the conductive material and the thickness of the insulating layer is selected for obtaining a desired level of comparatively good mechanical decoupling. The IBM Technical Bulletin is silent with regard to the elasticity of the resin balls and the use of this property to obtain mechanical decoupling between a chip and a circuit board. Therefore, a

combination of Akagawa et al. and the IBM Technical Bulletin does not teach or suggest the invention of instant application.

A person skilled in the art would also not be motivated to look to the teaching of Akram et al. to solve the problem of the invention of the instant application. Akram et al. teach an interconnect which includes an insulating substrate having conductive vias. The interconnect can be used to provide a temporary electrical connection to a chip during testing, for example. In contrast, the invention of instant application teaches a contact between a semiconductor chip and a printed circuit board which is located and fabricated on the chip and which results in an improved mechanical decoupling of the chip when mounted on a printed circuit board. The invention of instant application does not require a separate substrate as taught by Akram et al.

Even if one skilled in the art did look to the teaching of Akram et al., he or she would not arrive at the invention of instant application because Akram et al. do not teach or suggest that conductive material between a contact pad and a ball can be used to obtain a mechanical decoupling effect as recited in claim 1 of the instant application.

There is no suggestion in the disclosure of Akram et al. that would lead one skilled in the art to include elastic conductive material in an opening formed on the semiconductor chip. Akram et al. teach the use of an electrically conductive adhesive layer to attach a ball to a contact pad which protrudes from the surface of an interconnect substrate (see column 7, lines 43-45).

There is also no suggestion in the disclosure of Akram et al. that would lead one skilled in the art to realize that a mechanical decoupling could be achieved through the use of an electrically conductive material having an elasticity in conjunction with a ball having an elasticity.

It is clear from the diagram of Akram et al., for example Fig. 3, that the adhesive layer used to attach a ball 38 to the contact pad 36 cannot have a mechanically decoupling effect as taught by the invention of instant application. The contact bumps 18 of a semiconductor chip 20 are attached via an interconnect 40 to contact pads 36 and balls 38 which provide the connection to a test apparatus, for example (see column 8, lines 26-44). As taught by Akram et al. in column 8, lines 41-44, during the test procedure the component 20 and the interconnect 40 are biased together to aid in the electrical engagement and penetration of the bumped external contact 18.

This is achieved, for example as shown in Fig. 6, by a carrier spring.

Akram et al. teach the opposite effect to that desired by the invention of the instant application. A person skilled in the art would have no motivation to look to the disclosure of Akram et al. Even if he or she did, there is no suggestion that the elasticity of the conductive material could be used to obtain a mechanical decoupling between a chip and a printed circuit board as recited in claim 1 of the instant application.

In summary, the technical fields of the cited documents are sufficiently different from the problem to be solved by the invention of the instant application that a person skilled in the art would not be motivated to combine them. Also, even if the person skilled in the art did combine the documents, the component or method of the invention of the instant application would not be arrived at by the combination. None of the documents addresses the technical problem of the invention of the instant application. None of the documents teaches or suggests the use of the elastic properties of a ball. None of the documents teaches or suggests the use of the elastic properties of the conductive material placed between the contact pad and the ball. None of the documents

teaches or suggests that the combination thereof would result in a desired level of comparatively good mechanical decoupling from a printed circuit board upon the semiconductor component being soldered onto the printed circuit board.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 and 3. Claims 1 and 3 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claims 1 or 3, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-5, 13-17, and 19-24 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

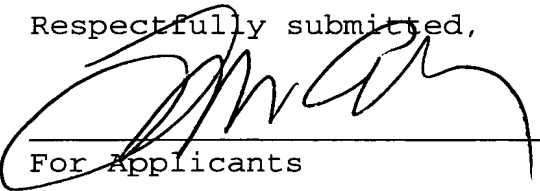
If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to

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the Deposit Account of Lerner and Greenberg, P.A., No. 12-
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Respectfully submitted,

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